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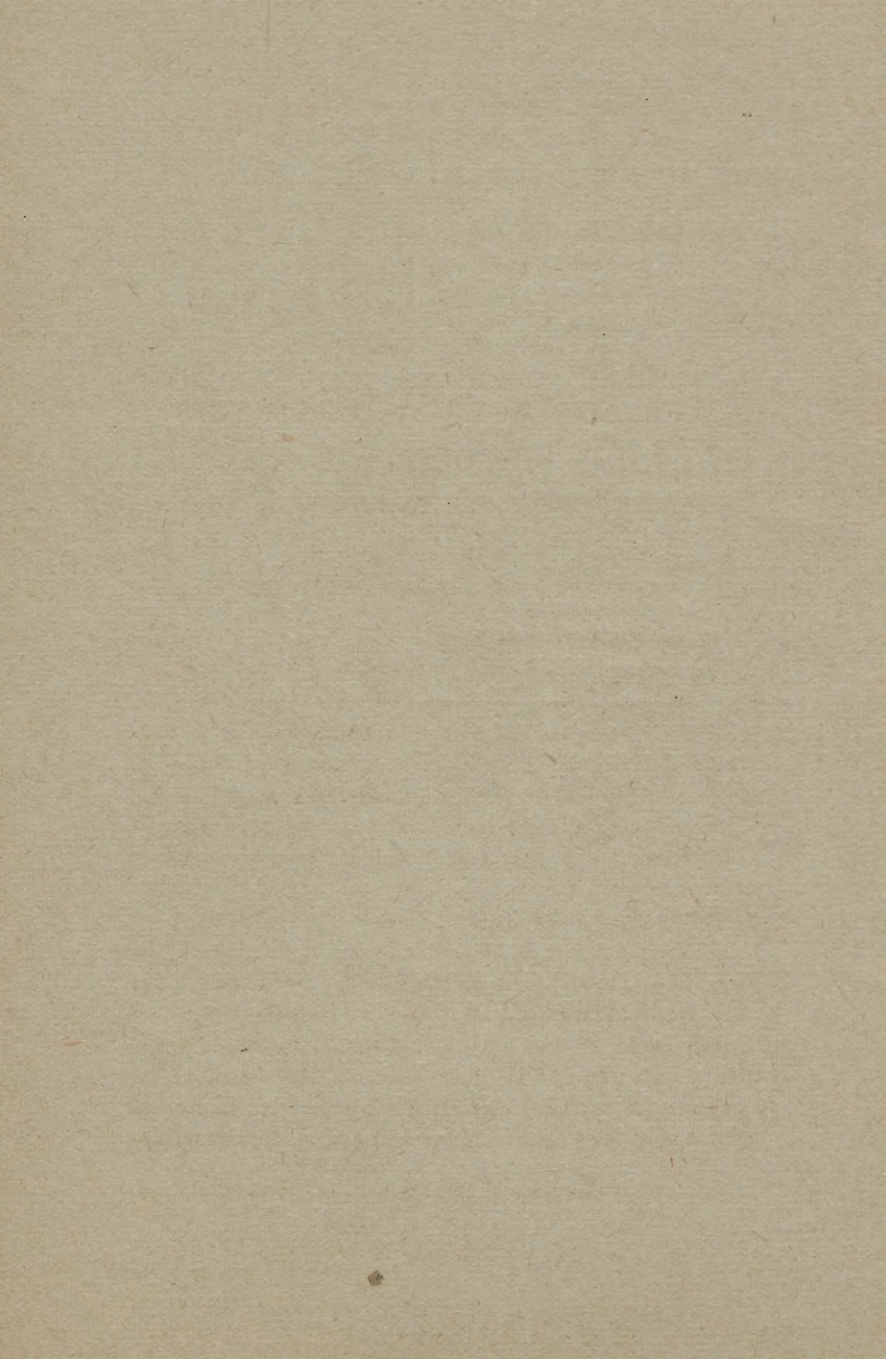
BY

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Surgeon-General, U. S. Army (Retired List).

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ON CERTAIN ORGANIC EXTRACTS:  
THEIR PREPARATION  
AND PHYSIOLOGICAL AND THERAPEUTICAL EFFECTS.

BY WILLIAM A. HAMMOND, M. D.,  
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SINCE the experiments of Brown-Séquard, more than three years ago, observers in various parts of the world have been engaged in similar investigations, not only with the juice of the testicles, but with extracts obtained from other glands of the body. So far, however, as I am aware, no systematic researches have been undertaken along the line of those the details of which I am about to give, and with which I have been occupied almost continuously since the summer of 1889.

In the *New York Medical Journal* for August 31, 1889, I published a report of some of the results obtained by me with the expressed juice of the testicles of the ram. The cases reported were one of traumatic neuritis, which was entirely cured by one injection, after having lasted longer than a year; two of cardiac weakness, with some of the symptoms of so-called neurasthenia, one of which has remained entirely cured without subsequent treatment, and

the other (Case II), after repeated injections at different periods, is now entirely well; one of sexual impotence, in which there has been no relapse; two of muscular rheumatism and lumbago, which have remained cured; one of hemiplegia, the result of cerebral hæmorrhage, in which the patient was improved in walking, as reported, but who subsequently died from a second attack; one of melancholia, with fixed delusions, which underwent no improvement and of which I know nothing subsequently; and one patient suffering from cardiac asthma, the result of excessive mental work, and whose cure has continued to this day.

In regard to these cases I said:

"It is not necessary for me to draw any conclusions from these experiments, as they speak for themselves. It will be seen that there is evidence to show that we have in the testicular juice a valuable addition to our *materia medica*, the precise worth of which, however, it is not yet in our power to establish."

So far, I have nothing to retract from what was stated in the article in question; but the paragraph before the final one I am obliged, as the result of much more extensive observation, to take back, so far, at least, as it expresses a preference for the expressed and fresh juice. It is as follows:

"One point further seems to call for some consideration. I have observed that some of the experimenters sterilize the testicular juice before using it. If there is any virtue whatever in the liquid, it would be entirely destroyed by such a process. It might as well be boiled as sterilized. Experiments with such a substance are absolutely valueless. Sufficient immunity against the propagation of disease can be obtained by examining the fluid microscopically before it is injected into the system. Whatever is capable of killing the germs of disease would be equally capable of killing the

vital germs upon which the testicular juice depends for whatever efficacy it may possess."

So far from these statements being correct, I am satisfied that the method I am about to describe results in the procuring of a far more powerful agent than is the fresh juice, and that the latter can not always be used with safety, liable as it is to produce local abscesses and serious constitutional disturbance. In more than a third of the cases in which I have used it abscesses were produced, and in several painful swelling of the arm into which the injection was thrown, with fever, and in one case delirium.

Since that time I have not only continued to use the extract of the ram's testicles in those cases in which I conceived it to be indicated, but have extended my observations to a study of the influence exerted on the human body by the extract of other organs, especially that of the brain, the spinal cord, the pancreas, the thyreoid gland, and the heart. For the three years past I have pursued these investigations, and if I have not rushed into print as soon as some others it is only for the reasons that time has been required to prepare the extracts according to the processes I have found most advantageous, and that I did not wish to commit myself to opinions that further examination might prove to be erroneous. The time now, however, seems to have arrived at which I can lay the main points of my researches before the medical profession. I do not give them all at this time, for I have not yet reached definite conclusions in regard to all the matters embraced within the line of my investigations. I state, however, sufficient to give a clear idea of the theory upon which they have been conducted, and which, as it will presently be seen, admits of very extended amplification. I am quite sure that the system I am about to bring to the notice of the profession is not only well founded in fact, but is in accordance

with physiological law, and that we have in it philosophical means of combating disease, of which I can only lay some part of the foundation, but which, through the accumulation of material by other observers, will eventuate in the erection of a permanent and worthy therapeutical structure.

This system, briefly stated, is as follows :

Organic beings possess the power of assimilating from the nutritious matters they absorb the peculiar pabulum which each organ of the body demands for its development and sustenance. The brain, for instance, selects that part which it requires, the heart the material necessary for its growth and preservation, and so on with the liver, the lungs, the muscles, and the various other organs of the body. No mistake is ever committed. The brain never takes liver nutriment, nor the liver brain nutriment ; but each selects that which it requires. There are, however, diseased conditions of the various organs in which this power is lost or impaired, and, as a consequence, disturbance of function, or even death itself, is the result.

Now, if we can obtain the peculiar matter that an organ of the body requires and inject it directly into the blood, we do away with the performance of many vital processes which are accomplished only by the expenditure of a large amount of vital force.

Let us suppose a person suffering from an exhausted brain, the result of excessive brain-work. Three hearty meals are eaten every day, but, no matter how judiciously the food may be arranged, the condition continues. Now, if we inject into that person's blood a concentrated extract of the brain of a healthy animal, we supply at once the pabulum which the organ requires. Then, if under this treatment the morbid symptoms disappear, we are justified in concluding that we have successfully aided Nature in doing that which, unassisted, she could not accomplish.

That is the system. I believe it is applicable not only to the brain, but to all the other organs of the body.

And yet I am not quite sure that it is entirely new. I recollect reading nearly forty years ago an account of some observations made by, I think, a German physician relative to the treatment of diseases of the several organs of the body by a system of diet consisting of the corresponding organs of healthy animals. Thus liver disease was treated by beef's liver, heart disease by beef's heart, brain disease by beef's brain, and so on. My memory seems to be clear on the main point, but I have searched in vain for the paper to which I refer. The fact, however, that the various foods in question were cooked and were taken into the stomach constitutes a great difference with the system which I am now discussing, both physiologically and therapeutically, and the results do not admit of comparison. The germ of the idea, however, is the same, and I cheerfully yield to my unknown proto-observer whatever distinction may be claimed on the score of priority.

Besides, there have been isolated observations made within the last two or three years by German and French physicians which are to some extent in accordance with those which I have been conducting, but they do not seem to have led to any definite results or to have been systematically carried out. Generally they have been performed with the fresh juice of the organs, and although at first sight this method would appear to be preferable to any other, experience shows that it is, as I have said, not unattended with danger. Thus the organ may not be entirely fresh, morphological matter is almost certain to be injected, it is nearly impossible to filter the juice through a porous stone filter, and when passed through common filtering-paper sub-

stances injurious to its action and provocative of local abscesses and constitutional disturbance can not be excluded. Indeed, these results have frequently followed from the experiments of others, and I have myself, as I have stated, often encountered them, notwithstanding that all possible care was taken in the preparation and administration of the agent. The method, however, which I have finally adopted never produces either morbid local or general disturbance beyond a slight smarting at the time of injection and occasionally a little subsequent itching and erythema, and it is that also from which I have derived the maxima of beneficial effects. It has been arrived at after many trials and consequent disappointments, and it is one which, with our present knowledge of the subject, I do not think can be advantageously departed from.

Taking the brain as a type of the process employed—and it is not materially varied with the other organs of the body—it is as follows:

The whole brain of the ox, after being thoroughly washed in water acidulated with boric acid, is cut into small pieces in a mincing machine. To one thousand grammes of this substance placed in a wide-mouthed glass-stoppered bottle I add three thousand cubic centimetres of a mixture consisting of one thousand cubic centimetres each of a saturated solution of boric acid in distilled water, pure glycerin, and absolute alcohol. This is allowed to stand in a cool place for at least six months, being well shaken or stirred two or three times a day. At the end of this time it is thrown upon a porous stone filter, through which it percolates very slowly, requiring about two weeks for entirely passing through. The residue remaining upon the filter is then inclosed in several layers of aseptic gauze and subjected to very strong pressure, the exudate being allowed to fall upon the filter and mixed with a sufficient

quantity of the filtrate to cover it. When it has entirely filtered it is thoroughly mixed with the first filtrate, and the process is complete.

During the whole of this manipulation the most rigid antiseptic precautions are taken. The vessels and instruments required are kept in boiling water for several minutes, and are then washed with a saturated solution of boric acid. Bacteria do not form in this mixture under any circumstances, but it is necessary to examine it from time to time microscopically in order to see that no foreign bodies have accidentally entered. Occasionally, from causes which I have not determined, the liquid becomes slightly opalescent from the formation of a flocculent precipitate. This is albuminous in its character. It sometimes takes place in a portion of the extract kept under apparently identical conditions with other portions that remain perfectly clear. It is certainly not an essential constituent. It can be entirely removed by filtration through Swedish filtering paper previously rendered antiseptic without the filtrate losing any of its physiological or therapeutical power.

Five minims of this extract diluted at the time with a similar quantity of distilled water constitute a hypodermic dose.

The most notable effects on the human system of a single dose are as follows, though in very strong, robust, and large persons a somewhat larger dose is required, never, however, exceeding ten minims:

1. The pulse is increased in the course of from five to ten minutes, or even less in some cases, by about twenty beats in a minute, and is rendered stronger and fuller. At the same time there is a feeling of distention in the head, the face slightly flushed, and occasionally there is a mild

frontal, vertical, or occipital headache, or all combined, lasting, however, only a few minutes.

2. A feeling of exhilaration is experienced which endures for several hours. During this period the mind is more than usually active and more capable of effort. This condition is so well marked that if the dose be taken at about bedtime wakefulness is the result.

3. The quantity of urine excreted is increased when other things are equal by from eight to twelve ounces in the twenty-four hours.

4. The expulsive force of the bladder and the peristaltic action of the intestines are notably augmented—so much so that in elderly persons in whom the bladder does not readily empty itself without considerable abdominal effort, this action is no longer required, the bladder discharging itself fully and strongly, and any existing tendency to constipation disappears, and this to such an extent that fluid operations are often produced from the rapid emptying of the small intestine.

5. A decided increase in the muscular strength and endurance is noticed at once. Thus I found in my own case that I could “put up” a dumb-bell weighing forty-five pounds fifteen times with the right arm and thirteen times with the left arm, while after a single dose of the extract I could lift the weight forty-five times with the right arm and thirty-seven times with the left arm.

6. In some cases in elderly persons an increase in the power of vision is produced and the presbyopic condition disappears for a time.

7. An increase in the appetite and digestive power. Thus a person suffering from anorexia and nervous dyspepsia is relieved of these symptoms, temporarily at least, after a single dose hypodermically administered.

These effects are generally observed after one hypoder-

mic injection, and they continue for varying periods, some of them lasting for several days. In order that they may be lasting, two doses a day should be given every day or every alternate day as may seem necessary, one in the morning and one in the afternoon, and kept up as long as the case under treatment seems to require. The most notable effects are seen in the general lessening of the phenomena accompanying advancing years. When some special disease is under treatment the indications for a cessation of the injections will be sufficiently evident either by an amelioration or cure or a failure to produce these results.

To the substance obtained in the manner mentioned and held in solution I have given the name of cerebrine as the one, in view of its origin, most appropriate.

I have employed the solution of "cerebrine" with decided advantage in cases of nervous prostration—the so-called neurasthenia—in insomnia due to cerebral hyperæmia, in migraine, hysteria, general paresis, hebephrenia, and epilepsy. In these latter—two cases of the *petit-mal* variety—the effect has been so marked that I am not without the hope that cures will result, although I am not able as yet to speak positively on this point, the patients having been less than a month under treatment. In two cases of the *grand mal* the number of paroxysms has been reduced more than one half and greatly mitigated in severity. In six other cases which were of long duration I could perceive no curative effect.

In the case of general paresis no permanent therapeutic influence was apparent, though for several days the *délire de grandeur* was absent. In the case of hebephrenia, however, occurring in the person of a young lady eighteen years of age, the effect has been most happy, the symptoms entirely disappearing in a little more than a month's treatment.

In two cases of nervous prostration, the result of long-continued emotional disturbance and in which there were great mental irritability, dyspepsia, physical weakness, loss of appetite, and constipation, relief was rapidly afforded. In three other cases, in which the most notable symptom was functional cardiac weakness, the effect has been all that could have been desired. In these cases it was employed in conjunction with "cardine," the extract of the heart of the ox made in the manner already described.

It is not my intention at the present time to enter into a full discussion of this interesting subject or to allude further to experiments in the treatment of other diseases which are not yet concluded. In the near future I shall enter more largely into the consideration of the subject in all its details. I may add, however, that I have used with excellent results, in cases in which it seemed to be indicated, the extract of the testicles of the bull and also that of the pancreas of the ox, and these investigations also will be given to the profession at an early day.

It is alleged by some medical writers that there is no difference in the therapeutical effects of medicines whether they be taken directly into the blood by hypodermic injection or ingested into the stomach; but it is scarcely worth while to seriously combat this assertion. For, while it may be true that some substances are not altered by the gastric juice before they are absorbed into the system, it certainly is not true of many others, and it surely is erroneous as regards those of animal origin. Indeed it is, I think, doubtful if anything capable of being acted upon by the gastric juice and of being absorbed into the blood gets into the system in exactly the same form in which it got into the stomach.

Thus the vaccine virus may be swallowed with impunity,

as may also the poison of the rattlesnake and of other animals secreting toxic agents. Upon one occasion I gave a young dog, by the mouth, twenty minims of fresh rattlesnake poison without its having the slightest perceptible effect upon him. I need not say that this quantity would have been sufficient to kill at least fifty men. Woorara, which is, as is well known, fatal to animal life when injected into the blood, is innocuous when taken into the stomach, and even those that do possess some action when swallowed exert this power in much less degree and require larger doses for it to be produced.

Relative to the animal extracts to which this communication refers, I have ascertained beyond question that if they are inclosed in capsules so as to reach the stomach without coming in contact with the mucous membrane of the mouth, they are absolutely without physiological or therapeutical effect so far as can be perceived, even when given in quantities of a teaspoonful or more. But if dropped upon the tongue in double the quantity used for hypodermic injections, and allowed to remain in the mouth without being swallowed—thus avoiding the action of the gastric juice—they are absorbed, and exert a slower but still decided effect. If employed in this manner, three or four doses should be taken daily. Ten minims of the solution of cerebrine placed upon the tongue of a healthy person will cause acceleration of the pulse, flushing of the face, and slight headache in ten or fifteen minutes, together with the other phenomena I have mentioned.

I have expressed the opinion that the substance extracted from the brain and other organs is the material required for the nutrition of the corresponding organs of the body, but this is only a theory to which I am not in the slightest degree attached, though I think it physiological and plausible. It may be that the mixture of ~~ure~~ acid, alcohol, and

*eric*

glycerin exerts a metamorphic influence and causes the formation of a ferment having the power of restoring to the weakened brain or other viscus the lost or impaired power of assimilation. However this may be, the facts remain unaltered.

WASHINGTON, D. C., *January 14, 1893.*



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